

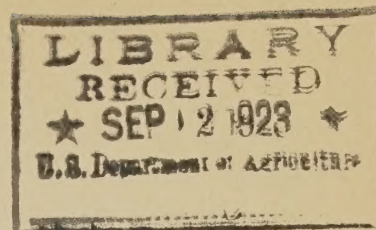
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United States Department of Agriculture.

Dairy Exhibit - 1923.



Animal Nutrition

The work on protein metabolism done by a number of scientists during the past decade has brought out the following fundamental facts of direct practical importance in animal nutrition. Some of them are illustrated in this exhibit.

1. When the proteins in the diet are digested they are broken up into 18 to 20 different substances - the amino-acids. Each diet protein yields these amino-acids in a characteristic and constant proportion.

2. The amino-acids that are formed in the digestive tract pass from there in the blood to the various organs and tissues of the body. The concentration and composition of the mixture of amino-acids in the blood depends upon the diet.

3. The animal organism itself does not in general make amino-acids, but depends upon the proteins of the diet for them.

4. Certain particular amino-acids have been shown to be absolutely essential for maintenance, for growth, and for milk secretion.

5. The proteins in different feeds differ in their value for these functions, depending upon the completeness and proportion in which they supply these essential amino-acids. They are decidedly better in some feeds than they are in others. The amount of protein that must be fed for normal growth, maintenance, and milk secretion, therefore, depends upon the kinds of protein which are found in the ration. One kind of protein may supplement the deficiency in another.

6. Amino-acids that are not used in these special ways may be converted into fat or carbohydrate, or may be oxidized like fat or carbohydrate as a source of energy.

The work on the metabolism of amino-acids in relation to milk secretion, that has been carried on by the U. S. Department of Agriculture at Beltsville, Md., has brought out the following important points, some of which are included in the material of the exhibit.

1. The mammary gland manufactures the milk proteins from amino-acids, which it takes in definite proportions directly from the plasma of the blood.

2. The concentration of the amino-acid mixture in the plasma of the blood is relatively low in milking cows. The composition of it varies greatly, and may differ widely from the proportion in which the mammary gland uses the amino-acids in making milk proteins.

3. As much as 34 per cent - on an average 25 per cent - of the whole amount of amino-acids in the plasma may be taken out in a single passage of the blood through the gland. This means that the blood plasma is almost entirely depleted of the amino-acids in which it was relatively most deficient.

4. The plasma mixture of amino-acids, because of being either low in concentration or poor in composition, frequently limits the amount of milk secreted, and the concentrations of fat and protein in the milk. The concentration and composition of the plasma mixture of amino-acids are affected by the amount or quality of the protein and the amount of carbohydrate in the ration. The plasma mixture, therefore, is apparently the "king-pin" by which a change in either the protein or energy content of the ration affects the yield and composition of milk.

These facts place new emphasis upon the importance of selecting for dairy cows those feed mixtures which supply adequate amounts of all the amino-acids required by the mammary gland to make the proteins in milk.

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UNITED STATES DEPARTMENT OF AGRICULTURE

DAIRY EXHIBIT, 1923.

CONDENSED AND EVAPORATED MILK.

Little work has been done by public institutions on the many problems that perplex the manufacturer of condensed and evaporated milk.

In the last few years the laboratories of the Dairy Division have been investigating some of these questions, and the exhibit on this subject is designed to show the nature of these investigations, especially the effect of forewarming upon the finished product. It also shows some of the equipment available for the work.

In sterilizing evaporated milk the manufacturer is obliged to heat the finished product to a temperature sufficiently high to destroy all bacteria. At the same time it must not be heated high enough to produce a hard curd which will detract from the appearance or palatability of the product.

The factors which influence the temperature at which this curd is formed is one of the questions being investigated. One of the charts in the exhibit shows the effect on the coagulating temperature from the extent and method of forewarming the milk before it is drawn into the pan. The lower forewarming temperatures, 55 and 65 degrees C., slightly unstabilize evaporated milk toward heat. There is an increase in stability from 75 to 100 degrees C., the maximum stability occurring between 95 and 100 degrees. At higher forewarming temperatures, such as 110 and 120 degrees, there is a decline in stability.

In making sweetened condensed milk one of the serious difficulties encountered is the thickening which takes place, sooner or later, in all condensed milk. With increased forewarming temperature there is at first a slight increase in stability, then a distinct decrease at 95 degrees, and a marked increase at higher temperatures. Thus the usual forewarming temperatures are shown to be the most unfavorable for condensed milk.

The temperature of forewarming has been shown to be of more importance than the time of forewarming, for both condensed and evaporated milk, although time is a factor. It is apparent that an equilibrium condition of the milk salts is probably reached in forewarming, depending largely on the temperature. Other charts give data showing that a chemical reaction takes place when milk coagulates. This reaction is probably the precipitation of calcium and magnesium as phosphates and citrates. The thickening of condensed milk upon storage is a chemical effect, apparently the same as that taking place when either condensed or evaporated milk is subject to higher temperatures.

The equipment for the work on condensed and evaporated milk includes, in addition to the bacteriological and chemical laboratories, a miniature factory in which all the factory operations can be carried out on a small scale. At the Grove City, Pa. creamery there is a complete small-scale commercial unit for making both condensed and evaporated milk, operated by the Dairy Division. In this plant new methods are tested before the results are made public. This equipment is shown in the exhibit by means of a model of the plant.

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The equipment for the work on condensed and evaporated milk included, in addition to the bacteriological and chemical laboratories, a whey curdling factory in which all the factory operations can be carried out on a small scale. At the Grove City, Pa., factory there is a complete well-arranged unit for making both condensed and evaporated milk, operated by the Dairy Division. In this plant the methods are tested before the results are made public. This equipment is shown in the exhibit by means of a model of the plant.

The laboratory where the investigations on condensed and evaporated milk are carried on is completely equipped with the regular condensing and sterilizing apparatus. It is located on the fourth floor of the East Wing of the Department of Agriculture building at Washington.

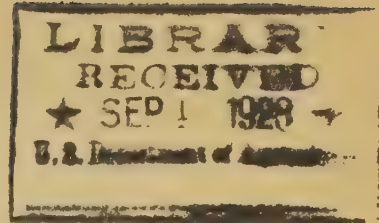
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UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923.

DAIRY CATTLE BREEDING.



The object of this exhibit is to emphasize the importance of the proper selection of the herd sire. Statistical studies conducted by the Dairy Division have brought out clearly what has been accomplished through the use of sires which vary materially in their ability to transmit high production to their offspring.

One part of the exhibit illustrates the influence of 30 sires as shown by the milk-production records of their daughters compared with the records of the dams of those daughters. For this study 154 bulls were used. All of these bulls had six or more advanced-registry daughters from advanced-registry dams. The ten best of the group raised the average production of their 137 tested daughters 1,924 pounds of milk over the production of their dams. Ten medium bulls sired 87 tested daughters which averaged 359 pounds of milk more than their dams; and the ten poorest bulls had 88 daughters averaging 1,415 pounds of milk less than their dams.

In another part of the exhibit is given detailed information on two of the best and two of the poorest sires studied. The production of the individual daughters does not follow closely that of their dams in either case, but there is a distinct difference between what is transmitted by good bulls and poor bulls.

The value of those sires which are able to transmit high production can not be overemphasized, and it is a real misfortune that many of this class of bulls are lost before their worth is appreciated. When a prepotent bull of this kind is slaughtered prematurely, it is a distinct loss to the breed and to the dairy industry. Bulls capable of transmitting high production should be permitted to go on breeding, and should have every opportunity to leave large numbers of their progeny when their days of usefulness have passed. The central feature of the exhibit is justly entitled the "Gallery of Regrets."

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923.

EFFECT OF HOMOGENIZATION IN THE MANUFACTURE OF ICE CREAM.

The improvement of quality in ice cream is a factor of great importance, both to the manufacturer and to the consumer. The problem in this connection is to improve quality without greatly increasing cost.

One of the common defects in ice cream is the presence of minute crystals of milk sugar which give the ice cream a coarse and gritty texture. Changes in the speed of the freezer and in the temperature of freezing tend to make a finer-textured product, but such manipulations do not entirely eliminate the difficulty and they usually result in a low overrun.

This exhibit gives the results of an experiment by the United States Department of Agriculture. It was found that by the use of the homogenizer it is possible greatly to improve the texture of ice cream without decreasing the yield. Trials were made with both the raw cream and the mix. In each case there was a decided improvement in texture where either the cream for the mix or the mix itself was homogenized, as compared with ice cream from material which had not been homogenized. There was also an appreciable increase in the yield.

The results were equally satisfactory from cream testing 12 per cent fat with added milk solids not fat, and from cream 16 per cent fat without added milk solids not fat.

In carrying out this experiment, 68 persons assisted in judging the quality of the various ice creams. These persons were asked to state their preference on 279 different samples. On the ice cream having low fat content, 47.6 per cent of the preferences were in favor of the homogenized mix, 43.2 per cent were for the homogenized cream, and only 9.4 per cent for the non-homogenized material.

With the high-fat ice cream, 36.4 per cent of the preference were for the homogenized mix, 63 per cent for the homogenized cream, and only 0.6 per cent for the nonhomogenized. These preferences show that the homogenization of the mix is not so beneficial in the high-fat product as in the low-fat, but in each case the homogenized product was superior to the non-homogenized.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923.

THE SWISS-CHEESE EXHIBIT

The purpose of this exhibit is to show the progress which has been made by the Dairy Division of the U. S. Department of Agriculture in the experimental study of Swiss-cheese manufacture. The main points brought out by the exhibit are the following:

- (1) Representations are shown of two type of bacteria which have been found essential to the proper curing of Swiss cheese. The two organisms are known respectively as ; (1) Lactobacillus bulgaricus, the organism which controls many abnormal fermentations; (2) Bacterium acidipropionici, the organism which produces the eyes and flavor.
- (2) It has been shown experimentally that certain types of gassy fermentations may be suppressed by a higher cooking temperature.
- (3) The fact is illustrated that the relation of fat to casein in the milk, especially during the summer months, is important in the prevention of cracks or checks in Swiss cheese.
- (4) One section shows that centrifuging the milk results in an improvement in eye formation; the number of eyes is reduced and their size increased.
- (5) One of the undesirable types of gassy fermentations may be reduced by treating the milk with oxygen prior to manufacture of the cheese.
- (6) The tendency of Swiss cheese to have an over development of eye formation may sometimes be remedied by the use of a special bacterial culture.
- (7) Models of cheese are exhibited which show the various defects which commonly occur, while other models show the results obtained by the application of proper remedied methods.
- (8) The practical application of these methods in the field is shown by means of a map which gives the distribution of the factories in a certain section which use the Dairy Division methods. The average quality of cheese produced in these factories and the prices obtained for their product, as compared with the results obtained by neighboring factories which do not use these methods, are shown.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923.

THE CAUSE OF PIN-POINT COLONIES IN PASTEURIZED MILK.

The appearance of so-called pin-point colonies when pasteurized milk is plated has greatly disturbed health officials and milk-plant operators, and has led to much speculation as to what type of organisms these colonies represent.

This exhibit shows that in tests made by the United States Department of Agriculture at a milk-distributing plant where pin-point colonies were noticed, it was found that this trouble was caused by a thermophilic organism termed Lactobacillus thermophilus, which grows rapidly at the pasteurizing temperature.

The contamination of the milk did not become apparent until after the milk has passed the pasteurizer. The raw milk showed comparatively low counts, with very few pin-point colonies, while counts made on milk that had passed the pasteurizer were exceptionally high, and all were pin points.

Further tests made by the Department proved that the organism is harmless, and that it can be killed by heating to 180° F. for two minutes. The recommendation to plant operators where this trouble occurs is, first, to see that all apparatus is in good repair, showing no signs of leaks or cracks, and second, to heat the equipment thoroughly to 180° F. or over, for two minutes or longer. Live steam is recommended for the purpose.

INCREASE IN CONSUMPTION OF DAIRY PRODUCTS IN 1922 OVER 1921 (Cont'd)

COTTAGE, POT, AND BAKER'S CHEESE.

32,389,000 lbs.	1922	.30 lbs. per capita
<u>27,315,809 lbs.</u>	1921	<u>.26</u> do
5,073,191 lbs.	increase	.04 do

ICE CREAM

263,520,000 gal.	1922	2.43 gal. per capita
<u>244,000,000 gal.</u>	1921	<u>2.2</u> do
19,520,000 gal.	increase	.23 do

CONDENSED MILK.

1,377,445,182 lbs.	1922	12.69 lbs. per capita
<u>1,221,226,482 lbs.</u>	1921	<u>11.40</u> do
156,218,700 lbs.	increase	1.29 do

WHOLE MILK POWDER.

5,599,000 lbs.	1922
<u>4,243,000 lbs.</u>	1921
1,356,000 lbs.	increase

POPULATION

108,540,838	1922
<u>107,125,729</u>	1921
1,415,109	increase

SKIM MILK POWDER.

40,617,000 lbs.	1922
<u>38,546,000 lbs.</u>	1921
2,071,000 lbs.	increase

41,898,000 lbs. 1920

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923.

MILK FOR HEALTH

Studies in many communities in widely different sections of the United States indicate that from 12 to 30 per cent of the children are 10 per cent or more underweight. In each community the per capita consumption of milk was below what is considered the proper requirement for maximum growth and development.

Low milk consumption and undernourishment are not confined to our large cities, but are quite as common and frequently more common in rural communities. In many rural communities only one-half of the children are daily users of milk. The exhibit shows a child being weighed at school, and another having his height measured. Systematic weighing and measuring, together with the serving of milk lunches at school, have been great factors in reducing undernourishment.

Nutrition authorities generally agree that growing children require at least a pint of whole milk daily, and should have a quart if possible. Plenty of milk helps children to grow, to keep well, and to build strong, vigorous bodies.

All these points are brought out in this exhibit. There is also included an automatic lantern-slide lecture which tells the story of "Milk for all ages." Milk is now recognized as an important food for persons of all ages, in all walks of life. The baby, the mother, the growing child, the laborer, the thinker, the stout and the lean, all can use milk to advantage.

One part of this booth shows that there was a decided increase in consumption of dairy products in 1922 over 1921. Itemized figures giving the consumption of various dairy products for both years follow.

INCREASE IN CONSUMPTION OF DAIRY PRODUCTS IN 1922 OVER 1921.

WHOLE MILK (For household purposes).

46,672,560,000 lbs. 1922	50 gal. per capita
45,143,000,000 lbs. 1921	49 do.
1,529,560,000 lbs. increase	1 do

BUTTER.

1,797,077,025 lbs. 1922	16.55 lbs. per capita
1,727,928,626 lbs. 1921	16.11 do
69,148,399 lbs. increase	.44 do

CHEESE.

405,935,256 lbs. 1922	3.74 lbs. per capita
380,933,000 lbs. 1921	3.5 do
25,022,256 lbs. increase	.24 do

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923

MILK POWDER BOOTH.

The center section illustrates the efficient use of skim milk with statistical information regarding the milk powder that might be produced from this source.

The milk is shown entering the separator, the cream going to the churn on the right while skimmed milk flows into a tank from which it is fed to the drying chamber of a milk-powder machine. The spray of milk powder can be seen through a window in the drying chamber. The products, in which milk powder is used, are shown.

Another part of the exhibit illustrates the value of the proper moisture content of milk powder in its keeping quality. Curves are shown indicating the value of vapor as a determining factor of keeping quality. The regions of good quality, tallowy and fishy milk powder are plainly shown. In a shelf just below are samples of milk powder which show the defects described above. These samples are for inspection.

In another part is illustrated the effect of oxidation on various butterfats. This section also brings out the effect of moisture and light on butterfat. The visible changes that occur are shown by tubes of butterfat inserted at proper points on the curves, representing the amounts of oxygen absorbed by the various butterfats.

Samples of butterfats of varying keeping quality will be available for inspection.

1911

1912

1913

1914

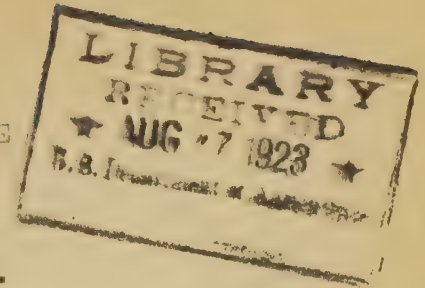
1915

1916

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit - 1923.

TEST FOR CONTINUOUS-FLOW PASTEURIZER.



Due to the construction and method of operation of continuous-flow pasteurizers, the time for which all of the milk is held at a certain temperature can be ascertained only by special tests.

Color, chemical, and thermal tests have been commonly used. Due to lack of sensitiveness and accuracy, criticism has been levelled against these tests.

The U. S. Department of Agriculture has devised a test which, it is believed, is very sensitive, accurate, and practical, to determine the holding time of continuous-flow pasteurizers.

The method of making this test is essentially as follows: The supply tanks, heaters, and holders are cleaned. The system is then filled with tap water at ordinary temperature. A supply of water sufficient to run the apparatus for 30 minutes at its rated capacity is essential. The apparatus is then run at its rated capacity, using water in the same way as when milk is being pasteurized, except that no heat is used. Repeated checks upon the rate of flow are necessary. Samples of the water for bacteriological analysis are taken at the inlet and outlet of the holder. These are check samples. A water emulsion of a 24-hour-old agar culture of the test organism (*Bacillus prodigiosus*) is then introduced at the inlet of the holder, the time being noted. Samples are then taken every 3 minutes at the outlet of the holder up to 18 minutes, and every minute thereafter up to 30 minutes. One c. c. of each sample is then plated, plain agar being the medium used. Plates are incubated for 48 hours at 20° C. (room temperature). At the end of this period the holding time is determined by the first plate in the series that shows the presence of the test organism. The organism produces a very characteristic and distinctive deep red colony. Check samples should show no red colonies if the test is to be accepted.

The test organism, *B. prodigiosus*, has a very characteristic growth, is easily cultivated at 20° C., is non-pathogenic, is easily killed and is infrequently found in water supplies.

Immediate cleaning of the apparatus, by the use of hot water and subsequent steaming, removes all traces of the test inoculation.

UNITED STATES DEPARTMENT OF AGRICULTURE.
Dairy Exhibit, 1923.

MILK PASTEURIZATION .

What is pasteurization? How does it affect milk. An exhibit of the U. S. Department of Agriculture entitled "Value of Pasteurization" tells you about the process of pasteurization, how it safeguards milk, and how the pasteurization of milk has increased in this country.

Pasteurization is not an arbitrary term, but is the name given to a process of heating liquids. The name was given in honor of the work of Pasteur in 1864. As applied to milk, the primary object of pasteurization is the destruction of any disease germs which may be present. Three processes of pasteurization have been used in this country; the flash process, the holder or holding process, and pasteurization in the bottle. In the flash process milk is heated in from 30 seconds to 1 minute to a temperature of at least 160° F. It is then immediately cooled and bottled. This process is not used extensively in this country for the pasteurization of milk. The holder process consists of heating milk to 145° F. in tanks and holding it for 30 minutes, after which it is cooled and bottled. This is the process most extensively used in this country. Sometimes milk is bottled first and then heated to 145° F., held for 30 minutes, and then cooled in the bottle. This process, known as in-the-bottle pasteurization, has many points to commend it.

Pasteurization gives protection without injury to the milk, as is shown by the following facts.

It has practically no effect on the chemical composition of milk. In milk pasteurized at 145° F. for 30 minutes the albumen and globulin are not precipitated, and neither is there change in the soluble salts.

Milk pasteurized at 145° F. for 30 minutes sours normally, and does not decompose, as many believe it does. The proportion of acid-forming bacteria to the total number of bacteria is actually increased when milk is pasteurized in this way, and the milk sours as normally as raw milk of equivalent bacterial quality. This is not true of high-temperature pasteurization.

Pasteurization has no effect on the vitamins fat-soluble A and water-soluble B. Water-soluble C is weakened or destroyed; but in the case of infant feeding this deficiency can be easily made up by the addition of orange or tomato juice. In the case of adults water-soluble C is amply supplied by green vegetables.

A very striking evidence of the value of pasteurization is shown in the center panel of the exhibit. This is an accidental human experiment which showed the usefulness of pasteurization as a safeguard against typhoid fever. The milk from one farm went to two cities. In one of these cities the milk was sold raw and in the other it was pasteurized. In the city which had the raw milk 12 cases of typhoid fever developed which were traced to the milk from that farm, but no cases developed in the other city

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit - 1923.

COW-TESTING ASSOCIATIONS.

The importance of keeping books on the dairy farm is emphasized in this exhibit. The bookkeeping may be done very effectively through the agency of a cow-testing association.

The cow-testing association is an organization of about 26 dairy farmers who cooperatively employ a tester to test their cows for economical production of milk and butterfat. Like a searchlight the association reveals the true record of each and every cow in the herd. Knowing the production, feed cost, and income records of his cows, the dairyman can eliminate guess-work and select or reject with certainty.

The cow-testing-association records seal the doom of the low producer, but the same records secure for the high producer and persistent milker an honored place in the dairy herd.

The exhibit shows what may be gained by belonging to an association over a period of years. Six years ago a certain herd of cows produced an income over cost of feed of only 64 cents per year per cow. This herd was in a cow-testing association, and the testing records showed to the owner what he had not discovered otherwise, about the way his herd was going, and how to set things right. To-day, after making use of the information gained from the cow-testing association records, his herd produces an average income over cost of feed per cow, of a little more than \$90 a year.

Do you belong to a cow-testing association? If so, on which side of the ledger does each of your cows stand? Every year your herd should show a gain per cow in production of milk, in production of butterfat, and in income over cost of feed. If your herd is not gaining day by day in every way, study the cow-testing association records and find out why.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit - 1923.

COOPERATIVE BULL ASSOCIATIONS.

Cooperative bull associations in the United States are getting results. As shown in this exhibit, such organizations meet the need for a widely adaptable system of breeding, reaching the farmer with a small herd, as well as the large breeder, at the same time extending the usefulness of high-class purebred bulls.

Only 25 per cent of the dairy bulls in this country are purebred. The service of these bulls should be extended as widely as possible. Individual ownership in a small herd places a limit on the service of purebred bulls. For example, a dairyman with 10 cows may purchase a purebred dairy bull to head his herd. He uses this bull for two years, and at the expiration of that time disposes of him, usually to the butcher. In this man's herd there may be 8 heifers in the two years, assuming one-half of the calves to be females.

Now suppose on the other hand this same bull had been purchased by a group of farmers, for one of the four blocks in a cooperative bull association. In this association he would be used on 75 cows a year, an increase of 65 cows a year. At the end of two years he is not disposed of to the butcher, but continues in service in one of the other blocks of the same association. In a four-block association this would mean eight years' service. His daughters, in the same ratio, would number 60 in the two years in each block, or 240 for the eight years in the association, as contrasted with the 8 daughters of the individually owned bull,

A study of cooperative bull association membership shows that such organizations furnish good purebred-bull service for all kinds and sizes of herds---the purebred, the grade, the scrub, the large, and the small herd, or even the family cow. The results derived from membership in such an association can be measured in two ways:

1. Improved type of the offspring.
2. Increased production of the daughters as compared with the production of the dams of those daughters.

The improvement in type and uniformity of the daughters can be seen in a visit to any bull association. Recently records of production of daughters and their dams in bull associations have become available, and the following table has been prepared from such data.

Production of Daughters of Bull-Association Bulls, as Compared with Their Dams.

County	:Number :of :records :	No. of times daughters excelled dams in milk	:No. of time :daughters :excelled dams :in butterfat	Percentage increase of daughters in milk	Percentage increase of daughters in butterfat.
Carroll (Md)	: 17	14	: 16	20.09	27.43
Mercer (Pa.)	: 18	9	: 10	4.75	10.85
Susquehanna (Pa.):	11	8	: 9	13.04	20.68
Campbell (Ky.)	: 12	11	: 11	45.45	34.01
Wilson (Tenn.)	: 12	9	: 11	27.77	33.08
Summary	: 70	51	: 57	22.22	25.21

THE HISTORY OF THE
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1858

where the milk from the same farm was pasteurized. Investigation brought out that a milker on the farm had typhoid fever and infected the milk. Pasteurization saved one city from an epidemic.

Such evidence as this, of the value of pasteurization, accounts for the remarkable increase in its use, as shown by charts in the third panel of this exhibit. As an illustration take New York City. In 1903 about 5 per cent of the milk supply of New York was pasteurized; in 1912, about 40 per cent; in 1914, about 88 per cent; and 1921, 98 per cent. The extent of pasteurization is equally striking in the smaller cities. Figures in 1921 from 38 cities of less than 10,000 population showed that in 22 of them 50 per cent of the milk was pasteurized; in 12 others, from 11 to 50 per cent of the milk. Some cities require the pasteurization of all milk except certified or equivalent grades. Experience with pasteurization may be summed up as follows:

1. No epidemics have been traced to properly pasteurized milk.
2. Proper pasteurization destroys the pathogenic organisms sometimes found in milk.
3. After pasteurization, milk is handled by so few people before it reaches the consumer that it can be protected against further infection by frequent medical inspection of the small number of people concerned.
4. Tuberculin testing properly used is a safeguard against bovine tuberculosis, but does not protect against typhoid fever, diphtheria, septic sore throat, and other milk-borne diseases. This emphasizes the need for pasteurization.
5. Pasteurized milk sours like new milk of equivalent bacterial quality.
6. The only change in milk caused by pasteurization is the reduction of vitamin C. This deficiency is easily supplied by feeding tomato or orange juice.
7. Pasteurization is increasing each year.

For further information send for U. S. Department of Agriculture Bulletin 342, The Present Status of the Pasteurization of Milk.

UNITED STATES DEPARTMENT OF AGRICULTURE.

Dairy Exhibit - 1923.

STEPS IN PRODUCING CLEAN MILK.

The fundamental factors in the production of clean milk are so few, simple, and inexpensive that they can be put into practice by any dairyman.

The first essential is clean, healthy cows and milkers. The cows should be regularly tuberculin-tested and examined by a competent veterinarian. No one wants to produce milk from a sick cow, nor subject the rest of his herd to infection from such a source. Cows should be groomed daily with a curry-comb and brush to keep them in better physical condition and to protect the milk from dirt, loose hair, etc. Just before milking, the udder and blanks should be wiped with a damp cloth to remove any loose dirt and to keep it from falling into the milk pail.

Milkers or milk handlers having any infectious disease should not milk cows or have anything to do with the milk, as they may infect it and cause disease among consumers.

A hooded or small-top milk pail protects the milk from dust and dirt falling from the body of the cow, and makes possible the production of a much cleaner milk.

Usually most of the bacteria in fresh milk come from unsterile utensils. Such utensils may be apparently clean, and yet may harbor great numbers of bacteria which contaminate the milk. Utensils should be first scrubbed with warm water and a washing powder, then rinsed; finally they should be steamed or boiled for five minutes in order to kill bacteria.

No matter how carefully milk may be produced, it always contains some bacteria. These organisms grow rapidly as long as the milk is warm. Prompt cooling to below 50° F. checks their growth. Milk should be cooled with the coldest water available, and should receive its final cooling with ice, except in cases where the available water supply will cool the milk to below 50° F.

In producing clean milk, dairymen not only perform a service to mankind by minimizing the dangers of impure milk, but they also perform a service to themselves. Consumers buy whole milk if it is clean and of good flavor. A better quality of dairy products can be manufactured from carefully produced milk. These things result in a wider market and increased prices for dairymen.

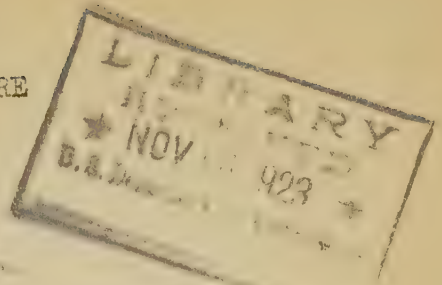
The important steps in producing clean milk are illustrated in the exhibit here shown.

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UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923.

A PASTEURIZATION PROBLEM.



The appearance of so-called pin-point colonies when pasteurized milk is plated has greatly disturbed health officials and milk-plant operators, and has led to much speculation as to what type of organisms these colonies represent.

This exhibit shows that in tests made by the United States Department of Agriculture at a milk-distributing plant where pin-point colonies were noticed, it was found that this trouble was caused by a thermophilic organism termed Lactobacillus thermophilus, which grows rapidly at the pasteurizing temperature.

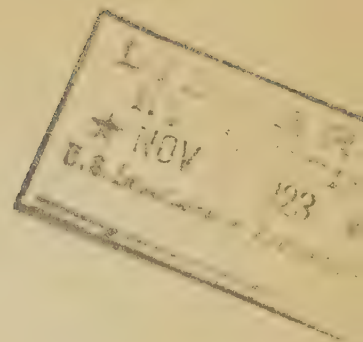
The contamination of the milk did not become apparent until after the milk had passed the pasteurizer. The raw milk showed comparatively low counts, with very few pin-point colonies, while counts made on milk that had passed the pasteurizer were exceptionally high, and all were pin points.

Further tests made by the Department proved that the organism is harmless, and that it can be killed by heating to 180° F. for two minutes. The recommendation to plant operators where this trouble occurs is, first, to see that all apparatus is in good repair, showing no signs of leaks or cracks, and second, to heat the equipment thoroughly to 180° F. or over, for two minutes or longer. Live steam is recommended for the purpose.

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UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923.



BETTER FEEDING - BETTER BREEDING

The value of feeding dairy cows and other livestock in accordance with the best modern practice is shown by an exhibit on this subject. The central feature contains the result of a Federal questionnaire inquiry conducted this year. Methods which nearly 500 successful farmers have used to improve their methods of feeding are briefly as follows:

Improvement in Methods of Feeding (in order of importance)

- | | |
|----------------------------|-------------------------------------|
| 1. Using balanced rations. | 5. Giving minerals to livestock. |
| 2. More liberal feeding. | 6. Feeding according to production. |
| 3. Feeding more legumes. | 7. Feeding more protein. |
| 4. Better water supply. | 8. More regular feeding. |

In addition to the methods mentioned the great majority of the stockmen reported that purebred animals were more efficient in the use of feeds. The estimates on the extent of superiority shown by financial returns varied widely with an average of 39.6 per cent for the improved stock.

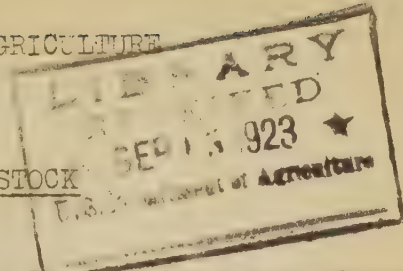
The importance of the bull has long been known in cattle breeding. However, the dam is also important. Many splendid herds have been produced from one good foundation cow. This exhibit shows a daughter following in the footsteps of her mother. The dam at mature age produced 13,490 pounds of milk, and 729.6 pounds of butterfat, in one year. Her daughter at the age of two years produced 7,359 pounds of milk, and 265 pounds of butterfat, in six months, a creditable record.

With cows as good as this it is absolutely essential that a high-class prepotent bull be used. The daughter would not be following in the footsteps of her mother if her sire had been inferior.

Another section of this exhibit shows the importance of keeping records of dairy cows. One cow with a good record belongs to a herd whose owner is a member of a cow-testing association. Another cow, very much inferior and without a record, is owned by a neighbor who is not a member of an association. The question is asked: Are you taking advantage of every opportunity to improve your herd?

UNITED STATES DEPARTMENT OF AGRICULTURE
Dairy Exhibit, 1923.

BETTER FEEDING OF LIVESTOCK



The value of feeding dairy cows and other livestock in accordance with the best modern practice is shown by an exhibit on this subject. The central feature contains the result of a Federal questionnaire inquiry conducted this year. Methods which nearly 500 successful farmers have used to improve their methods of feeding are briefly as follows:

Improvement in Methods of Feeding (in order of importance)

- | | |
|----------------------------|-------------------------------------|
| 1. Using balanced rations. | 5. Giving minerals to livestock. |
| 2. More liberal feeding. | 6. Feeding according to production. |
| 3. Feeding more legumes. | 7. Feeding more protein. |
| 4. Better water supply. | 8. More regular feeding. |

In addition to the specific method mentioned the great majority of the stockmen reported that purebred animals were more efficient in the use of feeds. The estimates on the extent of superiority shown by financial returns varied widely with an average of 39.6 per cent for the improved stock.

The facts obtained were gathered in connection with the "Better Feeding of Livestock" service which various States and the United States Department of Agriculture are conducting. This service provides for specific help in solving a feeding problem when a person is unable to obtain the desired information satisfactorily from bulletins, books, demonstrations, and other sources. Copies of the report, "Current Livestock Feeding Problems and How Farmers are Meeting Them," may be obtained upon application from the United States Department of Agriculture at Washington. Information on the individual feeding service may be obtained from the same source.

UNITED STATES DEPARTMENT OF AGRICULTURE
Dairy Exhibit, 1923.

TUBERCULOSIS ERADICATION

The exhibit, entitled "Tuberculosis Eradication," prepared to assist in the work of eradicating tuberculosis from the cattle of the United States, shows pictorially that external appearances can not be relied upon for detection of the disease.

Before the discovery of the tuberculin test in the early nineties, dairymen had no reliable means of detecting tuberculosis in their herds. Since the introduction of the tuberculin test, however, very rapid strides have been made in stamping out this dreaded disease until to-day the excellent results obtained from accredited herds are influencing progressive dairymen to eradicate tuberculosis from their cattle by having them tuberculin tested.

Comparisons of the advantages and disadvantages of having cattle affected with and those free of tuberculosis are given in a prominent place in the exhibit.

The entire center section of the exhibit is devoted to a large map of the United States showing in color the per cent of tuberculosis in cattle in each county.

Since about four per cent of all cattle in the United States are tuberculous, an appeal is made to every one to assist in eradicating this disease. Sanitation and systematic tuberculin testing enable dairymen to maintain their herds and communities free from bovine tuberculosis.

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UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit, - 1923.

DAIRY BARN VENTILATION

The booth devoted to barn ventilation explains how modern systems of ventilation operate to dry the air in the barn and thus add to the comfort and health of the cows, and prevent molding of feed and rotting of barn timbers. By means of a cross section of a typical modern barn the path of the air is traced from the time it enters the intake flues as cold outside air, through its passage into the stable at the ceiling and its descent into the barn, meanwhile becoming warmer and absorbing the moisture given off by the animals, until it leaves the barn and rises in the outtake flues to diffuse its burden of moisture in the air outside the barn.

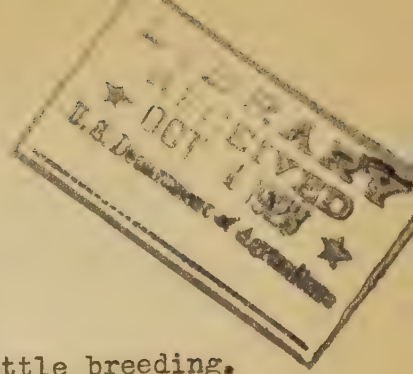
Attractively colored photographs contrast the old fashioned "crack system" of ventilation with the modern methods; the filthy stalls and barns, so common at an earlier period with the sanitary dairy barns that are now in the majority; and the straw shelter with the modern barn.

With the increased demand for clean, wholesome milk it has become necessary that each cow shall produce as much milk as possible. Greater winter production has been sought to increase the supply. This means tightly-built barns, particularly in the colder sections of the country, where most of the milk is now produced. Such barns are apt to be damp unless adequate ventilation is provided.

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UNITED STATES DEPARTMENT OF AGRICULTURE.
Dairy Exhibit -- 1923.

FEEDING SERVICE. (Side Sections)



The importance of the bull has long been known in cattle breeding. However, the dam is also important. Many splendid herds have been produced from one good foundation cow. This exhibit shows a daughter following in the footsteps of her mother. The dam at mature age produced 18,490 pounds of milk, and 729.6 pounds of butterfat, in one year. Her daughter at the age of two years produced 7,359 pounds of milk, and 265 pounds of butterfat, in six months.

With cows as good as this it is absolutely essential that a high-class prepotent bull be used. The daughter would not be following in the footsteps of her mother if her sire had been inferior. The higher the production of the cow, the more difficult it is to maintain that production in the next generation, and the more care is required in the selection of the bull.

One section of this exhibit shows the importance of keeping records of your cows. One cow with a good record belongs to a herd whose owner is a member of a cow-testing association. Another cow, very much inferior and without a record, is owned by a neighbor who is not a member of an association. The question is asked: Are you taking advantage of every opportunity to improve your herd?

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923

COOPERATIVE MARKETING

That "In union there is strength" is found the bed-rock of modern cooperative associations. In the exhibit devoted to Cooperative Marketing is shown The Bridge of Cooperation, the means of passing over the difficulties between the area of production and the place of consumption. From those qualities necessary to build a stable structure, experience has quarried the essentials, these being shown in the various sections that go to complete this bridge.

The cooperative bridge is being used more and more in getting products from the producer in the open country to the consumer in the crowded city. This is particularly true as regards dairy products - fluid milk, butter, cream, cheese and condensed milk. There are today in the United States several thousand cooperative creameries, several hundred cooperative cheese factories, several score of cooperative milk distributing plants, an equal number of bargaining associations for the determination of prices for fluid milk, and nearly a dozen large collecting and distributing milk marketing associations operating over wide areas, even groups of states.

Dairy producers by acting together are able to produce a more standard product, to obtain the economies of large-scale operation in connection with the assembling and processing of their milk and in many cases earn for themselves the rewards which go to those who cater to the desires of the consumer. Furthermore, by acting together, it has been possible to conduct campaigns in behalf of an increased consumption of dairy products.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit — 1923

WORLD TRADE MOVEMENTS

The dairy farmer in the United States no longer sells his produce in a market where local conditions alone determine the price. He finds himself competing in a world market with dairymen across the seas and discovers that the prices he receives for his dairy products are determined by conditions prevailing in the dairy industry the world over. Previous exhibits have emphasized this fact.

The exhibit "World Trade Movements" pictures the international dairy trade of the year 1922. A large world map indicates the sources of surplus milk products and their destination. The relative importance of each country as importer or exporter of the different products separately, is shown by charts. Thus it is possible to see the place of each in the great family of nations as a provider of dairy products, or as one receiving the dairy products of others.

This family did not come through the war without the circle having been broken. Russia, second largest butter exporter before the war, has dropped out. Other countries, by increasing their production, have taken the place of Russia in European markets.

But the shift in the sources of supply has resulted in less surplus from the Northern Hemisphere and more from the Southern Hemisphere. The further result is that the seasonal trend of supply in the important European markets has changed and, with it, the trend of prices. This is reacting directly or indirectly on the American market, which is only an important part of the world market, and it may come to influence still more in the future, either for better or worse, the prices at which dairy products are sold in this country. Developments of such nature, foreign as they are, come close to home when they affect our dairymen's pocketbooks.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit — 1923

MERCHANDISING DAIRY PRODUCTS

Merchandising consists in moving products from the producer to the consumer. There are many kinds of dairy products merchandised each of which moves mostly through its own particular channel of trade. Merchandisers of dairy products perform an important service in moving dairy products from producer to the consumer, as shown in the exhibit "Merchandising Dairy Products".

Next to market milk, butter is the most important dairy product. It is produced mostly in commercial creameries although considerable quantities are still made on dairy farms.

Most creameries obtain the raw material from farmers in the form of cream which is separated from the milk on the farm by hand centrifugal separators. This cream is churned into butter and shipped in car lots or less than car lot shipments to wholesale butter merchants in the larger markets. Nearly one half of all the creamery butter manufactured in the United States is shipped to the Boston, Chicago, New York and Philadelphia markets. Wholesale dealers supply smaller dealers, or jobbers, and the jobber in turn supplies the retailer, who supplies the consumer.

The service rendered by wholesalers in the larger markets is very important because, by their operations in buying and selling, they stabilize prices and markets by absorbing surplus products during seasons of heavy production and holding them until needed. Wholesale butter dealers also finance the marketing of butter by shippers and often extend credit to buyers.

Through the use of cold storage, perishable products are preserved in good condition until they reach the consumer.

Jobbers put dairy products in convenient form for retail sale and use by consumers.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923

DAIRY FARM ORGANIZATION

How many good cows should I keep, what crops should I raise, and what other kinds of livestock should I keep in order that the farm may yield the greatest return? These questions are discussed in an exhibit entitled "Dairy Farm Organization".

When planning the organization of his farm, every dairyman must have answers to these questions. Usually, the number of cows to keep is largely determined by the amount of feed which can be raised on the farm and by the amount of labor available for tending the crops and taking care of the cows. Dairyman in the Middle West have usually found it most profitable to keep the number of cows so adjusted to the crop production that only but little purchase of feed is necessary. Dairyman, in the eastern part of the country, whose farms contain a large amount of pasture and hay land and a comparatively small amount of good crop land, often find it most profitable to keep the size of their herds adjusted to the pasture and hay land, buying whatever grains and concentrates which may be necessary. In general, however, the man who raises most of his feed will realize a greater return than the man who must buy a large amount of feed.

Most dairymen who sell cream will find it advantageous to keep enough stock to use all their skim milk, this being a valuable feed for pigs, chickens and calves.

On the dairy farms in the Middle West where corn is one of the principal crops, hogs are often as nearly important as dairying.

On the farm where market milk is sold, however, it is often not profitable for other livestock to be kept. Here it may pay to even deacon the calves, rather than to raise them for veal.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923

U.S. DAIRY INDUSTRY STATISTICS.

Production and Uses of Milk

The statistics of the dairy industry are being used more and more each year. The Department of Agriculture is now able to furnish the industry with very complete information on the production and uses of milk and its products. In the exhibit the production of milk and its uses are illustrated by a huge milk can which represents a total of 102,562,221,000 pounds of milk produced in 1922. This milk can is sectioned to show how much milk was used by each branch of the industry. The milk required for household purposes was 45.5% of the total production; butter used 36.4%; cheese 3.6%; ice cream 3.5%; condensed milk, including evaporated, 3.5%; calves were fed 4.2%; 3% was wasted. The remainder, or .3%, was used for manufacture of other dairy products.

The Swiss Cheese Industry

The Swiss cheese industry of the United States during a part of the war period had no competition, but it has since felt the competition of foreign-made Swiss cheese. Importations of Swiss cheese in 1914 were 17,372,000 pounds, and the domestic production was about 14,000,000 pounds, thus making the total consumption for the year 31,372,000 pounds.

In 1918 there were no importations of Swiss cheese. Domestic production had increased to 19,363,000 pounds and the consumption was that amount. In 1921 the importation of Swiss cheese amounted to 1,048,000 pounds while our production increased to 22,678,000 pounds. In 1922 the imports increased to 4,085,000 pounds and our production decreased to 19,983,000 pounds, making the consumption 24,068,000 pounds for the year. The consumption of Swiss cheese in 1922 was over 7,000,000 pounds less than in 1914. It would appear from this statement that there is still a shortage of Swiss cheese; at least, consumption is still under the 1914 figures, and, undoubtedly, it will be supplied by foreign manufacturers if the American Swiss cheese makers do not produce it.

The Trend of Butter Production

Creamery butter production has been on the increase since the first factories were built, but of late years it has been very rapidly increasing, especially since the middle of the year 1920. In 1922 a production of more than a billion and 50 million pounds was recorded and, in 1923, the production is steadily increasing. The trend of butter production is shown by a chart in the exhibit and the trend of the receipts of butter on the four markets, New York, Chicago, Philadelphia and Boston is also presented. The trend of the receipts on these markets indicates month by month the trend of production.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923

DAIRY PRODUCTS STANDARDIZATION

Standardization of quality in dairy products consists in establishing definite standards whereby the quality of dairy products may be determined and the quality of different lots.

Standardization is essential to intelligent marketing because it furnishes a basis for establishing prices and also a basis for facilitating trading.

Standardization encourages the production of a high quality product because it insures to the producer of high quality a larger return.

Standardization also tends to increase consumption for through the encouragement of quality production it enables discriminating consumers to obtain maximum satisfaction in purchasing high quality products.

The United States Department of Agriculture has established national grades for butter which are used by the government butter inspectors in conducting a butter inspection service on the Boston, Chicago, New York, Philadelphia, San Francisco and Washington markets. The services of the federal butter inspectors are available to shippers and others.

Grades for whole milk American cheese also have been established by the United States Department of Agriculture and at Chicago and New York the service of federal agents' inspectors may be obtained in making cheese inspections.

Detailed information concerning United States grades for butter and cheese may be obtained upon request of the Bureau of Agricultural Economics, United States Department of Agriculture at Washington, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit --- 1923

MARKET NEWS SERVICE ON DAIRY PRODUCTS

Intelligent marketing can only be accomplished when there is knowledge of market conditions. In the endeavor to help dairymen, creamerymen, cheese factory operators, dealers and others of the dairy industry who need such information, the Department's Market News Service was established. It is now possible to obtain dairy market reports covering butter, cheese, condensed and evaporated milk, and powdered milk. These reports are issued in forms and manner to meet the needs of the various interests. For the wholesale receivers in the markets there are, each morning, inter-market telegraphic flashes indicating the tone and trend of the important markets. For the creameryman there is, by mail, the Daily Market Report containing complete price information on all grades of butter on the important wholesale markets with comments and data regarding supply, demand, etc. The milk producer and milk dealer are furnished quite complete information each month regarding buying and selling prices in a large number of cities scattered throughout the United States. The other reports are adapted to the various interests they are intended to serve. Dairy Market Reports available are shown in this exhibit. They are free for the asking.

Each market report contains information which may be used in a practical way. The center panel of the Market News Booth calls attention to some of this material and illustrates some of the uses. From the statistical data appearing in the Weekly Cheese Market Review, for example, it is possible to prepare a chart, which may be added to from week to week, showing the weekly trade output of cheese from Wisconsin. This, together with a study of statistics also presented covering receipts at warehouses, storage stocks, etc., makes it possible to ascertain current movements. Another use of market reports which is illustrated is in checking invoices covering the purchase or sale of butter or cheese. The Daily Market Report contains complete price information, and numerous buyers and sellers base their transactions on these reported prices. Not the least important information which the reports contain relates to the tone and trend of the market. It is upon this type of information that buyers depend in making their decisions as to whether they will meet sellers' asking prices, likewise, sellers are guided in their operations. It is obviously impossible to enumerate all of the uses of market reports, but these mentioned suggest a few of the more common ones.

Market news on dairy products is disseminated by the Department in different ways. Leased telegraph wire service enables a quick interchange of market information between the various market news offices. This method is used largely in transmitting market reports from the originating office to the offices which serve as distributing points, by mail or otherwise. Until within the past two years this market information reached interested persons largely by mail, but, with the development of practical radio broadcasting, all one needs to do now to "get the market" in many sections of the country is merely to listen. The map on the right panel of the booth shows the location of the principal points at which there are stations broadcasting dairy market reports by radiophone, together with the call letters and time schedule. This means of disseminating market news is new, and suggestions for the betterment of this particular service are welcomed.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923

STANDARDIZATION OF BUTTER AND CHEESE PACKAGES

The standardization of packages for all kinds of food products is a step forward in securing greater efficiency and economy in the marketing of these products.

The advantages in standardization of packages for dairy products are no exception to the general rule. At the present time each separate country uses a particular package of its own style in marketing butter in International trade. This fact is emphasized in the exhibit by means of samples of actual boxes, tubs and casks used in different countries.

As shown in the exhibit Denmark uses a cask containing 112 pounds, while the United States uses a tub containing 63 pounds. Canada, Argentine and New Zealand each use a box which contains 56 pounds, but the boxes used are of different dimensions. It should be readily obvious that if a box of certain dimensions is entirely satisfactory for use in Canada, a box of similar dimensions should be satisfactory for use in other countries.

If a tub is more satisfactory than a cask, or a cask more satisfactory than a tub, it would not seem desirable to use tubs in the United States and casks in Denmark when one is more satisfactory than the other.

It is recognized that there are too many styles of cheese and that these numerous styles tend to complicate not only problems of manufacturing but also problems of marketing and distribution.

Longhorns and Young Americas are both of similar shape, also, Flats and Daisies do not differ materially except in size. A Cheddar is practically the same diameter, but of twice the depth or height of a Flat.

If it were possible to reduce the number of styles of cheese and adopt not to exceed two or three as standard for universal use the problem of manufacturing and marketing the other styles would be eliminated and the whole problem of standardization of cheese packages greatly simplified and practically solved.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit -- 1923

COST OF MARKETING MILK

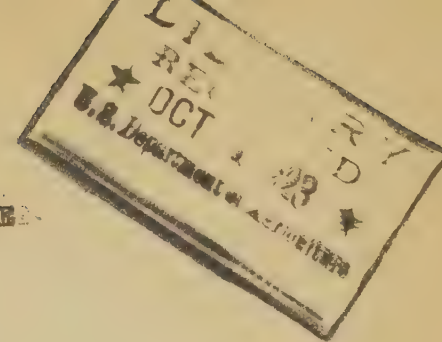
The Bureau of Agricultural Economics of the U. S. Department of Agriculture is engaged in the study of the marketing costs of various agricultural products.

The exhibit on this subject shows partial results of studies made in 1920 in the cost of marketing milk. The range of costs during 1919 for 28 representative Middle Western dealers are set forth. This range of costs will be of greater value in making comparisons than would the combination of high and low costs to produce an average figure, with which none of the dealers costs would compare.

Since delivery and selling expense, and plant expense, are the two largest items of cost next to the cost of raw material, these costs are analyzed for six dealers. In both these items of cost, labor is the largest single expense. Accordingly, efficient use of labor will reduce your cost of operation. Inefficient labor means higher costs because it takes more men to get the work done.

The wide variations shown in the range of costs for these representative dealers indicate the necessity for an adequate accounting system in a business where such variations are possible. The Department has information regarding accounting forms and procedure for the milk business and, upon request, will offer its suggestions.

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UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit, 1923.

THE SOYBEAN

The soybean is an erect, rather hairy annual leguminous plant, growing from two to six feet high. It is a plant of ancient cultivation in Asiatic countries. Within the last few years the soybean has become a crop of special importance in the world's commerce, and large shipments of beans, oil, and cake have been made from the Orient to America and European countries. The soybean was introduced into the United States in 1804, but it is only within the last few years that it has assumed much importance. The large commercial use of the soybean and its products, and the increasing use for food and for forage have resulted in an enormous increase in acreage. It is believed that the soybean will become one of the leading farm crops of this country.

In general, the climatic adaptations and soil requirements of the soybean are about the same as for varieties of corn and cotton. The soybean is more drought resistant and less sensitive to an excess of moisture than field beans or corn.

Culture. The preparation of the seed bed for soybeans is similar to that for corn. When sown on land not previously planted to this crop, it is advisable to inoculate. The best time for planting soybeans is about that for planting corn. When sown or drilled broadcast use 90 pounds of seed and in rows, about 30 pounds.

Varieties. The variety to be selected should be one adapted to local conditions and to the purpose for which the crop is grown. In view of the possibilities of this crop and its great agricultural development in the United States, it is important to utilize the very best varieties. Varieties of soybeans are differentiated largely by color and size of seed, though they differ in maturity, habit of growth, oil and protein content, yield, etc. The yellow-seeded varieties are to be preferred for food products, pasture, oil and cake, while the black and brown-seeded varieties are more suitable for forage purposes, giving more and finer forage. These varieties are shown in the exhibit.

Utilization. In extent of uses and value the soybean is the most important legume grown in the Orient. It is largely used by Asiatic people in the preparation of various foods. As the bean contains a valuable oil, large quantities are utilized by first extracting the oil and using the cake for stock feed and as a fertilizer. In the United States the soybean is used primarily for hay, soilage, ensilage and pasture.

Hay: The soybean when cut at the right stage of growth and properly cured makes an excellent hay of high-feeding value that is relished by all farm animals. The soybean will average about 2 tons to the acre. A sample of this hay will be found in the exhibit.

Straw: The straw obtained from thrashing soybeans for seed is a valuable feed for all kinds of stock.

Soilage: Having a high protein value the soybean may be fed to good advantage as a soiling crop with less nitrogenous crops, such as corn, sorghum, and Sudan grass.

Ensilage: The soybean forms a valuable supplement to corn for ensilage, making a well-balanced ensilage that keeps well, as will be noted from the samples shown. It is readily eaten by stock, and produces no bad effects in the quality of milk and its products.

Pasture: As a pasture crop, the soybean can be used to advantage for all kinds of stock, the most profitable method, perhaps, being to pasture with hogs, supplementing the corn ration.

Oil: Soybean oil is extensively used in Europe and America for food stuffs, in the manufacture of paints, lard and butter substitutes, soaps, enamels, linoleum, etc.

Cake or Oil Meal: The soybean cake remaining after the oil is expressed is ground into a meal and makes a highly concentrated feed. This meal is used in the dairy countries of Europe, practical experience having shown its high feeding value. Large quantities of imported oil meal have been used by dairymen and poultrymen in the Pacific States. Oil and cake are being produced from American-grown beans by oil mills in parts of the Corn Belt and the Cotton Belt.

Publications.

The soybean, with special reference to its utilization for oil, cake and other products, U. S. Dept. Agr. Bull. 439.

Harvesting Soybean Seed, U. S. Dept. Agr. Farmers' Bull. 886

The Soybean: Its Culture and Uses. U. S. Dept. Agr. Farmers' Bull. 973.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit, 1923.

THE SILO ON THE DAIRY FARM

There is no longer any doubt regarding the value of the silo to the dairy farmer. As shown in the exhibit, entitled "The Silo On The Dairy Farm", its advantages are so apparent that it scarcely seems necessary to restate them. However, there are farmers who do not fully appreciate what silage means in the production of milk and who are still seeking to be convinced that the money put into the construction of a silo is a profitable expenditure. The silo has at least three important points in its favor: (1) It makes it possible to provide a supply of succulent feed for cows throughout the year. (2) It makes it possible to utilize a part of the corn crop, which when everything is considered, is the most important forage crop of the United States, in the most economical manner. (3) By means of the silo a supply of excellent forage can be stored at a point accessible to the dairy barn so that cows can be fed with the minimum of labor.

There are many kinds of silos. Some are built in such a way as to be of a temporary nature. Others are built to last indefinitely. The farmer should determine for himself the kind of silo best suited to his needs and means.

It is not necessary that each individual farmer who owns a silo should have an engine and silage cutter for making silage. These can be owned on a community basis. One engine and cutter can be used to fill at least six silos if the farmers organize properly and the work is done efficiently.

As is pointed out in the exhibit, corn is by far the best of all crops as a silage crop where it can be grown. Soybeans added to corn silage have given excellent results where they have been tried. Where corn can not be grown successfully and sorghums can be grown, they may be used very advantageously for silage; likewise sunflowers may be grown for silage in certain sections where corn does not produce sufficient yield. Samples of these and other silages are shown in the exhibit by means of glass silos.

If the dairy farmer who does not possess a silo will investigate at once its merits, he will soon be convinced that he should have a silo on his farm.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit, 1923.

DAIRY CALF CLUBS AS AN EXTENSION AGENCY

The exhibit showing boys' and girls' dairy club work, as carried on by the United States Department of Agriculture and the State agricultural colleges, emphasizes the fact that this work is making a definite and important contribution to the training of future dairy farmers and the immediate improvement of dairy practices. Joining a dairy calf club offers the farm boy or girl an opportunity to actually engage for himself in a line of farming on a business footing and gives him a better understanding of the opportunities for successful achievement on the farm. From the moment the dairy club member buys his own purebred calf, usually giving his personal note for its purchase price, this calf is his particular interest. He feeds the calf a carefully planned ration and regulates the daily routine of its growth according to suggestions given by the club leader, county extension agent, or Department and State college publications. He learns to recognize the points distinguishing a productive animal from an unprofitable one. He exhibits his calf at the end of six months' or a year's care, in competition with others at community or county shows, and if he does not win a prize, himself, he knows the boy who did, and why, and is certain to acquire a strong desire to produce a better animal for the next show.

Before the boy who is a club member has been taking care of his calf very long, he and his father as a rule begin taking note of results of any difference there may be between the boy's care and feeding and that generally practiced in the neighborhood. If the stock on the farm is not purebred, they watch very closely to see if there really is quicker gain and better development in the purebred calf than in ordinary stock. The home herd in due time reflects the results of the club member's demonstration.

Comparatively few members drop out of the work at the end of one year; there are always a few improvements they want to make on last year's work and an exhibit or two they want to show in, the next year. Usually club members stay in the club several years, getting more expert in the dairy husbandry profession and adding one new calf or more each year until they develop into full-fledged partners with their fathers on the home farms or branch out into business for themselves. Last year (1922), 12,335 club members were enrolled for the study and practice of dairy husbandry; the total value of the animals and products resulting from their year's work is estimated at \$966,789.

UNITED STATES DEPARTMENT OF AGRICULTURE

Dairy Exhibit, 1923.

PASTURE NECESSARY TO SUCCESSFUL DAIRY FARMING

Few indeed realize the immense importance of pastures to the livestock industry and especially to dairying. As pointed out in this exhibit, pastures almost invariably are found on the poorest soil and the most unproductive parts of the farm. While it is true that the poorer soils and the roughest parts of the farm can be utilized better when devoted to pastures than to cultivated crops, nevertheless this is no reason why pastures should not receive good, intelligent treatment. In the northeastern part of the United States where bluegrass is the dominant pasture grass, the chief cause for weedy and brush-covered pastures is lack of a sufficient number of animals to graze upon them. This fact is emphasized in the exhibit by means of modelled representations of two bluegrass pastures, showing the condition of these pastures each year for a period of four years. On one pasture a sufficient number of dairy cattle were kept to maintain it in good condition. On the other pasture where too few cattle were grazed, weeds crept in so that by the fourth year it was in bad condition.

This point should be borne in mind; that the common pasture grasses of the northeastern quarter of the United States thrive better under close grazing than if they are allowed to grow as for hay. Under close grazing of pastures containing these grasses, livestock will suffer for want of feed before injury is done to the grass from overgrazing. When coarse weeds have invaded pastures they should be mowed with a scythe or mowing machine, and fodder that is fed on the pastures should be fed as nearly as possible on the parts that need enrichment most.

Patches of tall grass left by cattle should not be considered as reserve pasturage but rather as waste, as the cattle will not eat this tall grass unless driven to it by extreme hunger.

The health of the dairy herd is so much benefitted by the access of the cows to good pasturage that a dairyman can well afford to give his pastures much better treatment than the average pasture now receives.

Think of your pasture as a crop-producing field and treat it with the same consideration.

